

Client Architecture for the New Millennium

Albert Yu

Senior Vice President

Microprocessor Products Group

Pat Gelsinger

Vice President

Desktop Products Group

Intel Corporation

February 15, 2000

intel®

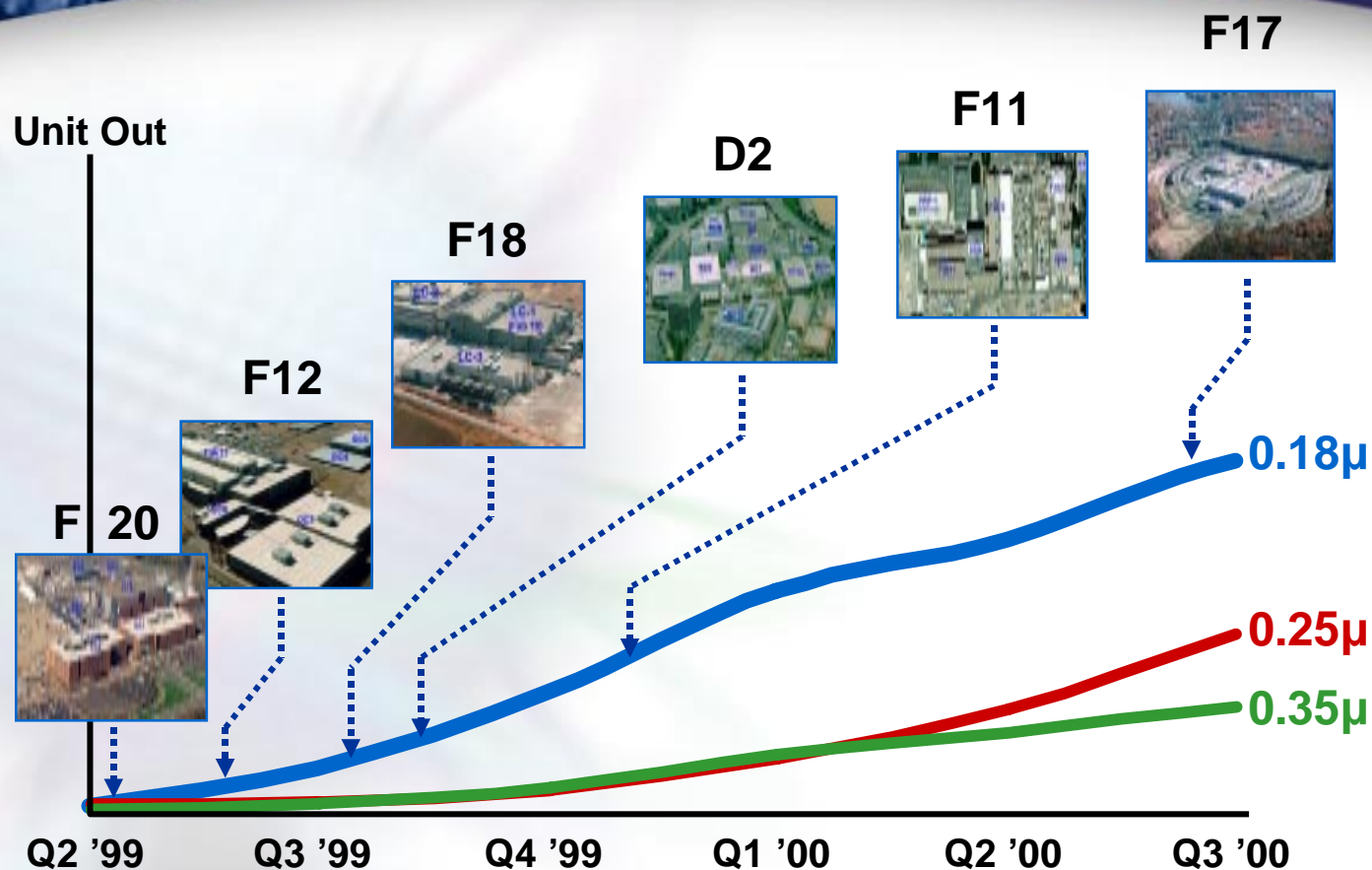
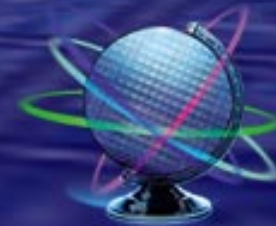
Agenda



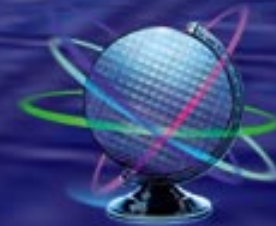
Building an e-World from...

- **Sand to Chips**
 - Manufacturing and Technology
 - IA Product Roadmap
- **Chips to Platforms**
 - Speed
 - Simplicity
 - Style
- **Platforms to Solutions**
 - e-Business
 - e-Home

The 0.18 μ m Ramp is the Fastest in Intel History



Capacity Investments for the Future



Intel To Invest \$800M In P858 Upgrade in Hudson

12/20/99*

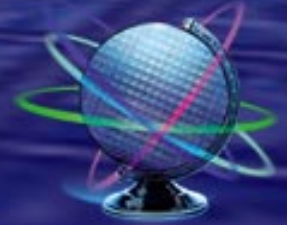
**Intel to Build Its First High Volume
300 mm Production Wafer Fab in Arizona**

1/25/00*

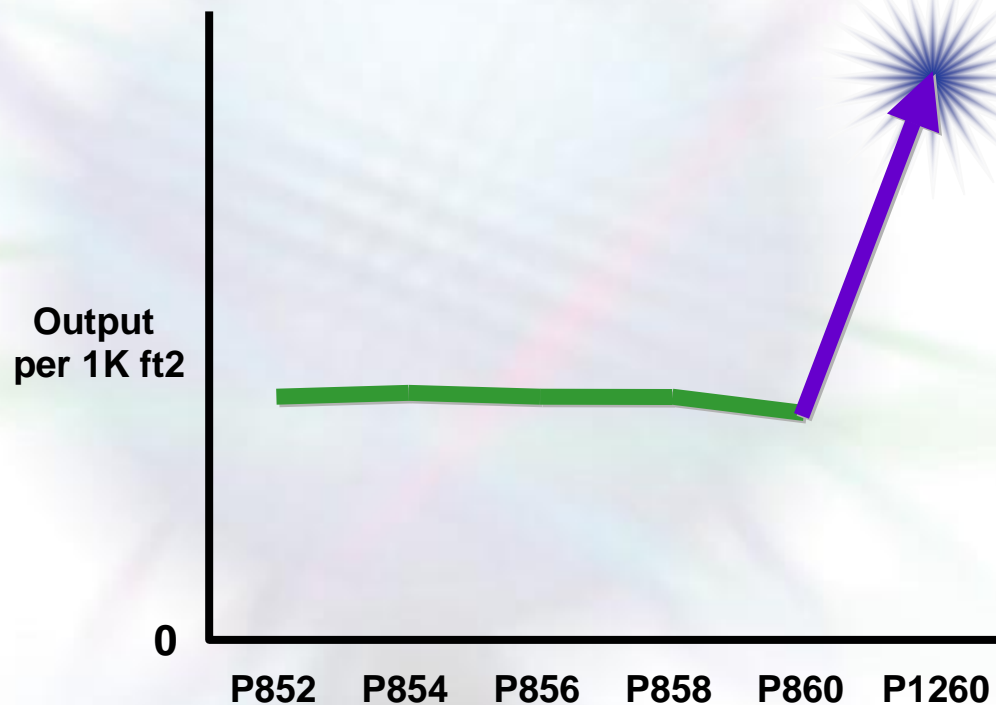
**Intel Announces Intent to Purchase
Colorado Springs Manufacturing Facility**

2/2/00*

300mm Manufacturing

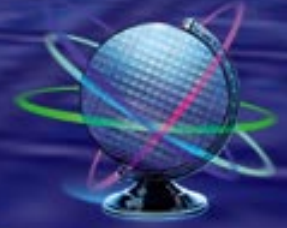


>2X Output per Sq. Ft. !

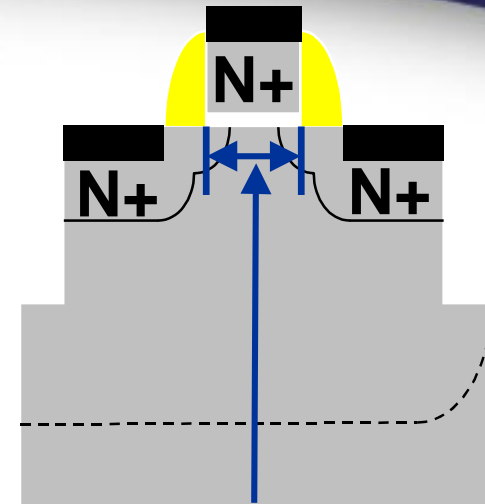


- Program activated in June '99
- First high volume 300 mm facility to be built in Arizona
- Plans to start 300 mm production in '02

0.18 μm Process Technology

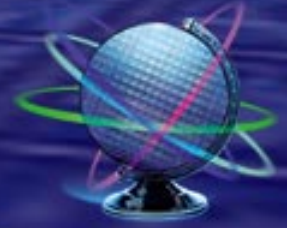


- .18 μm generation transistor

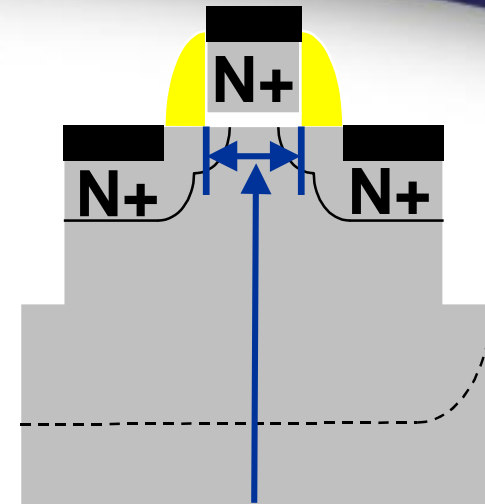


Minimum Gate Dimension
Approaching 0.10 μm

0.18 μm Process Technology



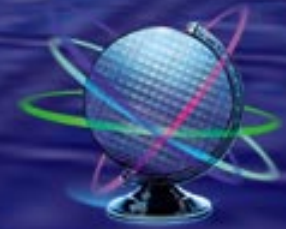
- .18 μm generation transistor



Minimum Gate Dimension
Approaching 0.10 μm

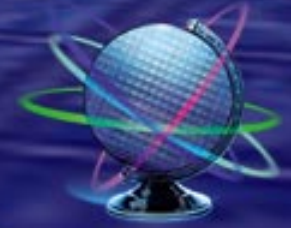
- 6-layer metal

Sneak Preview of 2001



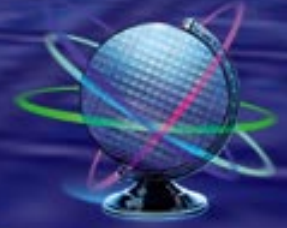
- **.13 μ m generation transistor**

Sneak Preview of 2001



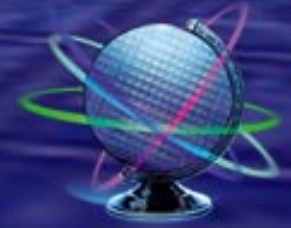
- **.13 μ m generation transistor**
- **Low-k dielectric**

Sneak Preview of 2001



- **.13 μ m generation transistor**
- **Low-k dielectric**
- **Copper interconnect**

Biggest IA Processor Year Ever



1H'00

2H'00

Server/
Workstation

Pentium® III Xeon™
≥ 900 MHz 256k

Performance
Desktop

Pentium III
≥ 900 MHz

Performance
Mobile PC

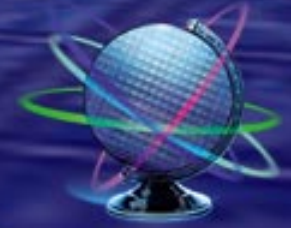
Mobile Pentium III
≥ 750 MHz

Value
Desktop

Celeron™
≥ 600 MHz

intel®

Biggest IA Processor Year Ever



1H'00

2H'00

Server/
Workstation

Pentium® III Xeon™
≥ 900 MHz 256k

Pentium III Xeon
1 GHz 256k

- First 1GHz processors

Performance
Desktop

Pentium III
≥ 900 MHz

Pentium III
1 GHz

Performance
Mobile PC

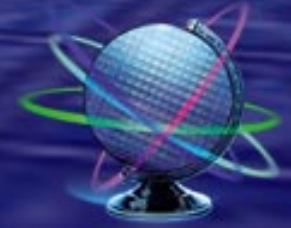
Mobile Pentium III
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Value
Desktop

Celeron™
≥ 600 MHz

intel®

Biggest IA Processor Year Ever



1H'00

2H'00

Server/
Workstation

Pentium® III Xeon™
≥ 900 MHz 256k

Pentium III Xeon
1 GHz 256k

- First 1 GHz processors

Performance
Desktop

Pentium III
≥ 900 MHz

Pentium III
1 GHz

- First Smart Integration processor

Performance
Mobile PC

Mobile Pentium III
≥ 750 MHz

Value
Desktop

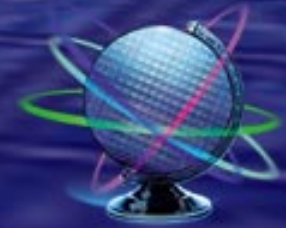
Celeron™
≥ 600 MHz

Celeron ≥ 700 MHz

Timna

intel®

Biggest IA Processor Year Ever



1H'00

2H'00

Server/
Workstation

Pentium® III Xeon™
≥ 900 MHz 256k

Itanium™
800 MHz

Pentium III Xeon
1 GHz 256k

- First 1 GHz processors

Performance
Desktop

Pentium III
≥ 900 MHz

Willamette
> 1 GHz

Pentium III
1 GHz

- First Smart Integration processor

Performance
Mobile PC

Mobile Pentium III
≥ 750 MHz

Mobile Pentium III
≥ 850 MHz

- Two new microarchitectures

Value
Desktop

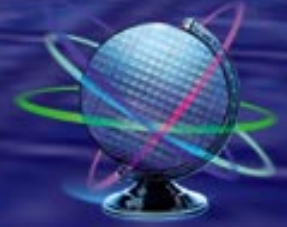
Celeron™
≥ 600 MHz

Celeron ≥ 700 MHz

Timna

intel®

Value Processor Segment



1H'00

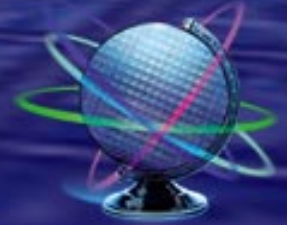
Celeron™
≥ 600 MHz
Intel® 810E



celeron™
PROCESSOR

intel®

Value Processor Segment



1H'00

2H'00

Celeron™
≥ 600 MHz

Intel® 810E

Celeron™
≥ 700 MHz

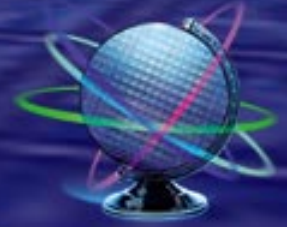
*Intel® 810E/
Intel® 815*

Timna

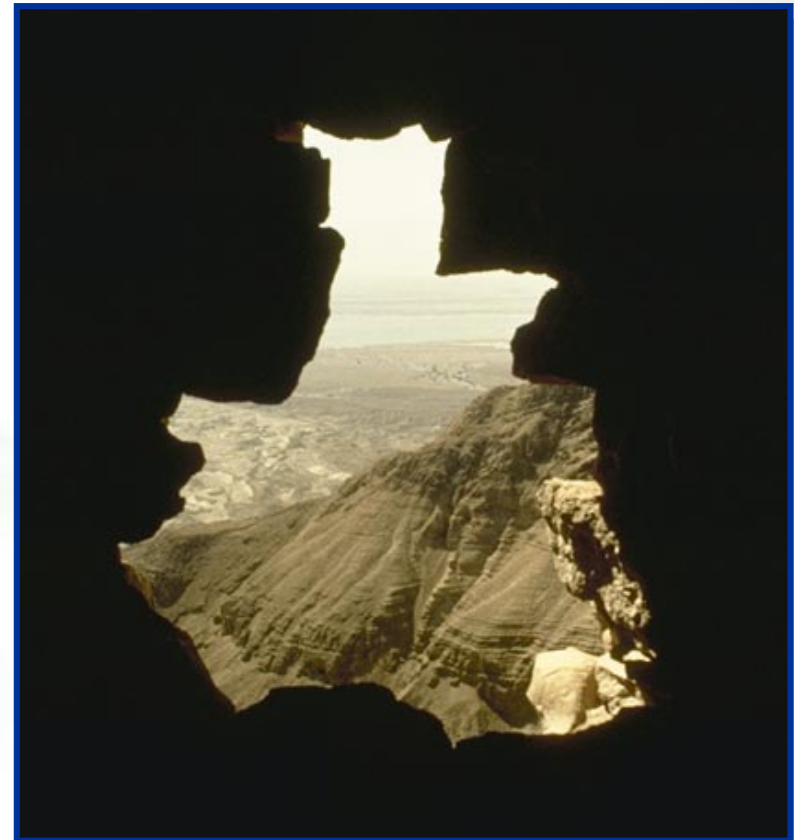


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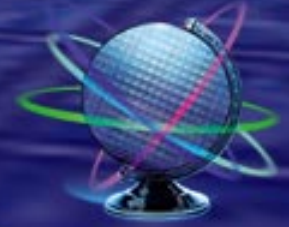
Timna: Smart Integration



- Designed specifically for <\$600 value PC segment
- Delivers performance, features, and cost benefits
- Enables lower overall system costs

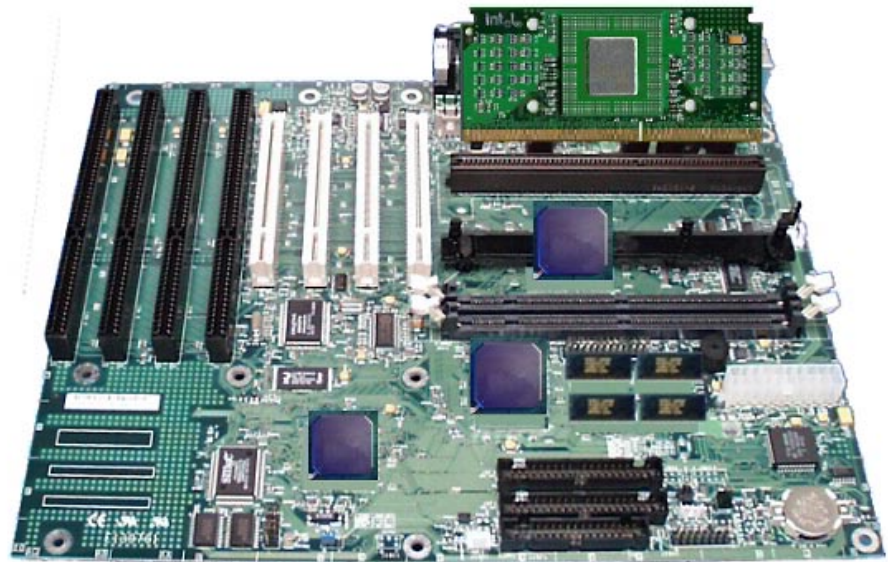


Timna



First Smart Integration processor

- P6 core using the 0.18 μ m process
- Integrated L2 Cache
- Integrated 3D graphics and memory controllers



Mobile Performance Processor Segment



1H'00

2H'00

Pentium® III
≥ 750 MHz

*Intel® 440ZX/
Intel® 440MX*

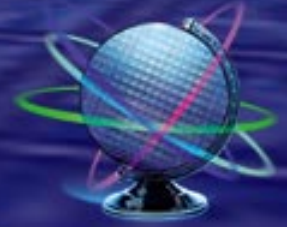
Pentium® III
≥ 850 MHz

*Solano 2 M/
Intel® 440ZX*

- Intel® SpeedStep™ technology launched January 18th
- Near desktop equivalency



Performance Processor Segment



1H'00

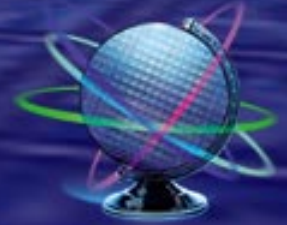
Pentium® III
≥ 900 MHz

*Intel® 820/
Intel® 815*



intel®

Performance Processor Segment



1H'00

**Pentium® III
≥ 900 MHz**

*Intel® 820/
Intel® 815*

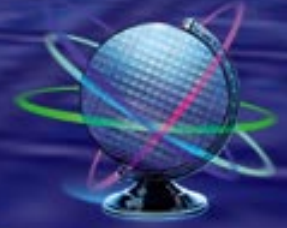


1 GHz Intel Pentium® III Processor

- Intel demonstrating world's first 1 GHz production systems
- Sampling customers now
- Limited production shortly

intel®

Performance Processor Segment



1H'00

2H'00

**Pentium® III
≥ 900 MHz**

*Intel® 820/
Intel® 815*

**Pentium® III
1 GHz**

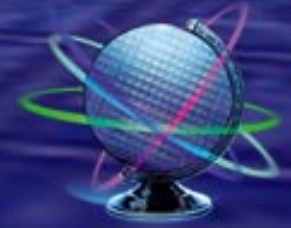
*Camino 2/
Solano 2*



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Performance Processor Segment



1H'00

Pentium® III
≥ 900 MHz

*Intel® 820/
Intel® 815*



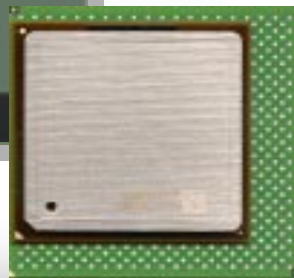
2H'00

Willamette
> 1 GHz

Tehama

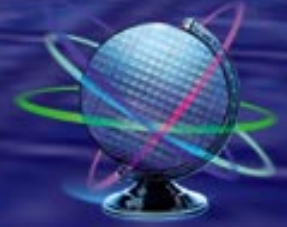
Pentium® III
1 GHz

*Camino 2/
Solano 2*



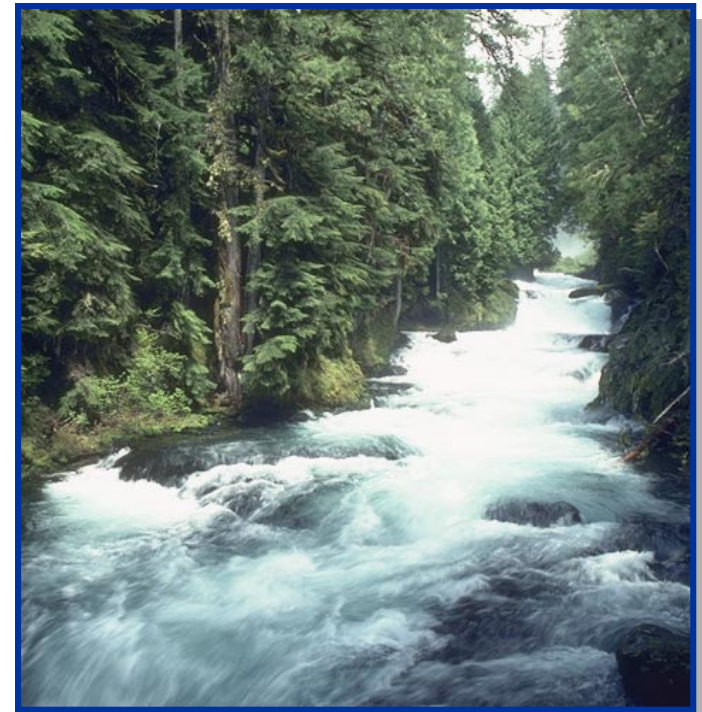
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Willamette: Breakthrough Microarchitecture

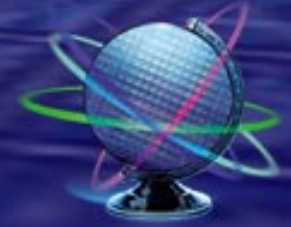


Next Generation IA-32 Performance Processor with Breakthrough Technology

- **New microarchitecture enables highest clock speeds for desktop PCs**
- **Streaming SIMD Extensions 2**
- **400MHz system bus:
3X Pentium® III processor**



Pentium® III Processor



- Dynamic execution
- Streaming SIMD Extensions

Shopping List

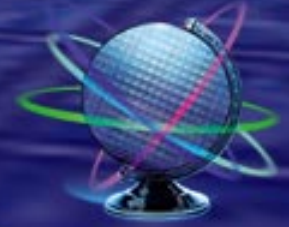
Milk
English Muffins
Peas
16 Sodas
Breadsticks
Pickles
Cucumbers
16 Cans of Corn
Fish Sticks
Swiss Cheese
Apple Sauce
16 Bananas
Butter
Orange Juice
Whipped Cream
16 Eggs
Potato Chips
Bean Sprouts
Nutmeg
16 Hot Dogs

Start **Stop**

PENTIUM® III PROCESSOR

intel®

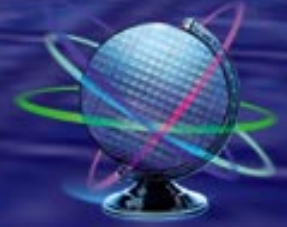
Willamette Microarchitecture



- Hyper Pipeline enables higher frequencies
 - 20 vs. 10 stages
- Integer ALU runs at 2x clock speed
- Streaming SIMD Extensions 2



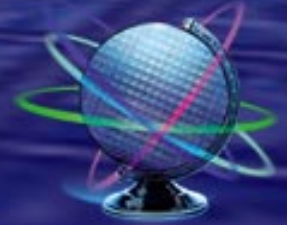
Streaming SIMD Extensions 2



	MMX™ Technology	Streaming SIMD Extensions	Streaming SIMD Extensions 2
Integer	64b	64b	128b
Floating Point		Single (4x32b)	Double (2x64b)

- **Boosts performance of:**
 - Video encode and decode
 - Encryption
 - Financial modeling and simulations

Accelerated Encryption



1024-bit RSA Key



...



MMX™
Technology

Faster by working on more and larger pieces at same time



...



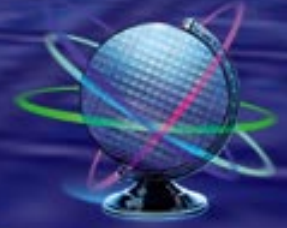
Streaming
SIMD
Extensions 2

- New operations for encryption
 - Two 32 * 32 multiplies per instruction
 - Two 64-bit additions per instruction
- 2-3x performance gains*

*Simulated performance of a Willamette processor with an Intel implementation of the RSA algorithm optimized for Willamette and fully loaded into the processor's cache compared to the actual performance on a Pentium® III processor 733 MHz of an Intel implementation of the RSA algorithm optimized for that processor. Data normalized to disregard the impact of frequency on the relative performance.

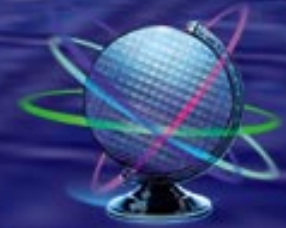


Willamette System Bus



- **Protocol and cache coherency**
 - Similar to P6 bus protocol
 - 128 byte cache lines with 64 byte sectors
- **3.2 GByte/sec data transfer rate**
 - 400 MHz system bus
 - Source synchronous 64-bit data bus

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1H'00

2H'00

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Itanium™
800 MHz

Pentium III Xeon
1 GHz 256k

- First 1 GHz processors

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Willamette
> 1 GHz

Pentium III
1 GHz

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Mobile Pentium III
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Desktop

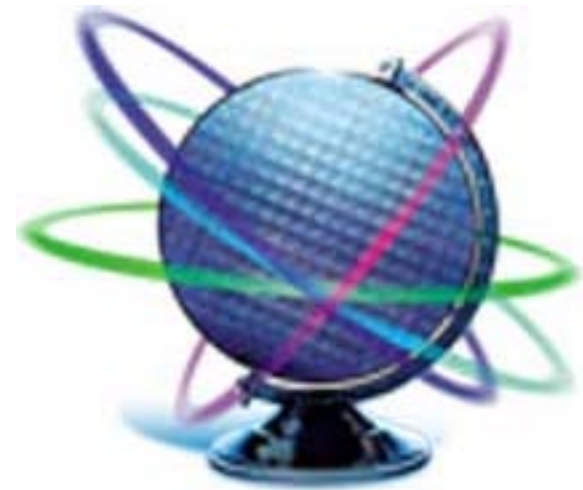
Celeron™
≥ 600 MHz

Celeron ≥ 700 MHz

Timna

intel®

Intel
Developer
Forum
Spring 2000



intel®